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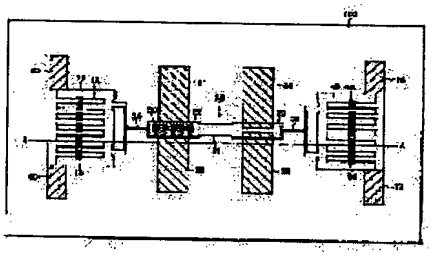
(54) LATCHING TYPE HEAT-DRIVEN MICRO-RELAY ELEMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an extremely small micro-relay capable of being integrated and having low contact resistance by changing the internal pressure of a storage chamber via a temperature difference, moving a conductive liquid metal in a channel, and closing or opening signal electrodes.
SOLUTION: Power is applied to the heater 12 of an active storage chamber 10 or the heater 42 of a passive storage chamber 40, the internal pressure of the storage chamber is changed by temperature, a liquid metal 50 is moved in a channel 20, and signal electrodes 34, 35 or 31, 32 are closed or opened. When power is selectively applied to the heater 12 or 42, the signal can be turned on or off. This latching heat-driven micro-relay element can be integrated in a silicon wafer bulk by the technique such as macro-burnishing, electroplating, and conductor process, and an extremely small micro-relay capable of being integrated and having small contact resistance can be obtained.



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* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.

2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

(57) [Claim(s)]
[Claim 1] The active storage shed 10 which was formed in the upper surface side of the semiconductor substrate 100 and which has predetermined volume, The passive storage shed 40 where interval detached building ****** of the active storage shed 10 and predetermined was carried out at the upper surface side of the semiconductor substrate 100 and which has predetermined volume, The heater 12 which heats the interior of the active storage shed 10, and the heater 42 which heats the interior of the passive storage shed 40, The channel 20 which plays a role of a move way of the contact metal formed so that the active storage shed 10 and the passive storage shed 40 might be connected, One pair of 1st signal electrodes 31 and 32 which were formed in the active storage shed 10 side of a channel 20 and by which the end was inserted in the interior of a channel 20, respectively, One pair of 2nd signal electrodes 34 and 35 which were formed in the passive storage shed 40 side of a channel 20 and by which the end was inserted in the interior of a channel 20, respectively, The liquid metal 50 mounted in the interior of a channel 20, and the up glass substrate 120 which was joined to the upper surface side of the semiconductor substrate 100, and was prepared, It has the lower glass substrate 130 which was joined to the undersurface side of the semiconductor substrate 100, and was prepared. a liquid metal 50 By the pressure variation of the active storage shed [by heating of heaters 12 and 42] 10, and passive storage shed 40 interior The latching heat drive micro relay element characterized by moving in the interior of a channel 20 and playing a role of one pair of 1st signal electrodes 31, the contact metal between 32 or one pair of 2nd signal electrodes 34, and a contact metal between 45.
[Claim 2] It is the latching heat drive micro relay element characterized by forming heaters 12 and 42 with the cantilever (cantilever) form in a latching heat drive micro relay element according to claim 1, respectively.
[Claim 3] It is the latching heat drive micro relay element which is further equipped with the heater susceptors 14 and 44 installed on the floor line of the activity storage shed 10 and the passive storage shed 40, respectively in a latching heat drive micro relay element according to claim 2, and is characterized by for heaters 12 and 42 floating from the floor line of the active storage shed 10 and the passive storage shed 40, making them by the heater susceptors 14 and 44, respectively, and supporting them.
[Claim 4] It is the latching heat drive micro relay element characterized by a liquid metal 50 being mercury or a gallium in a latching heat drive micro relay element according to claim 1.
[Claim 5] It is the latching heat drive micro relay element characterized by forming one pair of 1st signal electrodes 31 and 32, and one pair of 2nd signal electrodes 34 and 35 with any one metal in TiW, Au, Cu, and nickel in a latching heat drive micro relay element according to claim 1.
[Claim 6] It is the latching heat drive micro relay element characterized by forming heaters 12 and 42 with platinum, contest polysilicon, and nickel in a latching heat drive micro relay element according to claim 1.

[Claim 7] In a latching heat drive micro relay element according to claim 1 a channel 20 The micro channel field 21 which was established in the staging area and where the width of face of a channel is narrow, The 1st channel field 22 which was established in the active storage shed 10 side of the micro channel field 21 and which has latus width of face from the micro channel field 21, The 2nd channel field 23 which was established in the passive storage shed 40 side of the micro channel field 21 and which has latus width of face from the micro channel field 21, The 1st narrow channel field 24 with width of face

narrower than the micro channel field 21 prepared between 1st channel fields 22 and the active storage sheds 10, The 2nd narrow channel field 25 with width of face narrower than the micro channel field 21 prepared between 2nd channel fields 23 and the passive storage sheds 40, ****, and one pair of 1st signal electrodes 31 and 32 are installed so that an end may be inserted in the interior of a channel 20 in the 1st channel field 22, respectively. One pair of 2nd signal electrodes 34 and 35 are ** latching heat drive micro relay elements as the feature about being installed so that an end may be inserted in the interior of a channel 20 in the 2nd channel field 23, respectively.

[Claim 8] It is the latching heat drive micro relay element characterized by having the gestalt from which the narrow channel fields 24 and 25 of the 1st and 2 are extended by two narrow channels at the passive activity storage shed 10 and storage shed 40 side in a latching heat drive micro relay element according to claim 7, respectively.

[Claim 9] In the latching heat drive micro relay element according to claim 1, were formed so that it might result from the inferior-surface-of-tongue side of the semiconductor substrate 100 to the field between the active storage shed 10 of a channel 20 and one pair of 1st signal electrodes 31, and 32. The 1st hole 116 used for the injection channel for pouring in a liquid metal 50, The 2nd hole 118 used for the injection channel for pouring in a liquid metal 50 formed so that it might result from the inferior-surface-of-tongue side of the semiconductor substrate 100 to the field between the passive storage shed 40 of a channel 20 and one pair of 2nd signal electrodes 34, and 35, It is the latching heat drive micro relay element characterized by being formed so that ** and also the injection channel for pouring in a liquid metal 50 as it has and the 1st and 2 hole approaches a channel 20 from the inferior-surface-of-tongue side of the semiconductor substrate 100 may become narrow.

[Claim 10] The latching heat drive micro relay element characterized by having further the 1st wiring 60 which supplies a power supply to heaters 12 and 14, respectively, and the 2nd wiring 70 in a latching heat drive micro relay element according to claim 1.

[Translation done.]